



**ENVIRONMENTAL HEALTH & SAFETY FACT SHEET:  
LIMITATION OF USE OF FLAMMABLE GAS IN BIOLOGICAL  
SAFETY CABINETS**



Biological safety cabinets (BSC's) are designed to protect workers, their products, and their environment. Certain biological safety cabinets (BSC's) recirculate air within the cabinet. Most BSC's at UMass Amherst are recirculating. Open flames are not required in the near microbe-free environment of a biological safety cabinet. An open flame in a BSC creates turbulence which disrupts the pattern of HEPA-filtered air supplied to the work surface. The use of natural gas or other flammable gases within these BSC's may allow flammable gases to concentrate, potentially leading to an explosive atmosphere. The use of open flames within a BSC may alter the airflow pattern used to protect product and personnel. BSCs that recirculate air are commonly found at UMass Amherst. (Class II/A2).

**Dangers of natural gas use in a BSC:**

- Use of gas in BSC's has led to fires, compromised HEPA filters, destroyed cabinets and injured workers.
- Certain types of BSCs are designed to contain, not exhaust, most of the air within a cabinet. This makes them prone to the buildup of materials within the cabinet.
- If a gas leak occurs (e.g. valve left on or tube leak) inside a recirculating biological safety cabinet, over time the gas would become more concentrated and could reach explosive levels. Since it is within a BSC, the user may not detect the leak and, upon ignition, it could explode. Therefore, natural gas or other flammable gases should not be used within recirculating biological safety cabinets.
- The high efficiency particulate air (HEPA) filters, responsible for providing a sterile environment in the cabinet, can act as a dense mass of combustible material during an uncontrolled fire inside the cabinet.
- The heat convection currents generated by the open flame compromise the carefully controlled airflow pattern responsible for protecting product and personnel.
- Heat generated by an open flame can damage the HEPA filter and/or the filter's adhesive. This can produce leaks in the filter, adverse flow patterns in the cabinet, and potential user exposure.
- Use of an open flame within the BSC inactivates manufacturers' warranties on the cabinet: cabinet manufacturers will assume no liability in the event of fire, explosion or worker exposure due to the use of a flammable gas in the cabinet. Additionally, the UL™ (Underwriters Laboratories) approval will automatically be voided.

NIH/CDC: National Institutes of Health and the Centers for Disease Control and Prevention: "Open flames are not required in the near microbe-free environment of a biological safety cabinet. On an open bench, flaming the neck of a culture vessel will create an upward air current which prevents microorganisms from falling into the tube or flask. An open flame in a BSC, however, creates turbulence which disrupts the pattern of HEPA-filtered air supplied to the work surface."

WHO: World Health Organization's Laboratory Biosafety Manual:

Open flames should be avoided in the near microbe-free environment created inside the BSC. They disrupt the airflow patterns and can be dangerous when volatile, flammable substances are also used. To sterilize bacteriological loops, micro-burners or electric "furnaces" are available and are preferable to open flames.

The University of Massachusetts at Amherst concurs with the national and international agencies mentioned above, and does not support natural gas being plumbed to biological safety cabinets unless the cabinet is fitted with 100% exhaust air. BSC's that currently do not meet the 100% exhaust requirement, and are fitted for natural gas use, are discouraged from continuing to use natural gas and are encouraged to switch to safer alternative methods. However, should a situation arise where an investigator feels that natural gas is a necessity for their process the investigator may contact EH&S for a risk assessment and possible approval for future use.

**Alternatives to Gas Use and Alcohol Burners:**

1. Touch-plate burners that require a hand or foot switch for the flame to be engaged and gas cartridges vs. gas lines
2. Electrical incinerators
3. Glass bead sterilizers
4. Electric Bunsen burners
5. Mini propane torches
6. Use sterile disposable plastic ware instead of glassware that must be flamed
7. Rely upon good chemical disinfection (such as bleach) to clean equipment and surfaces

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